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THE

OPHTHALMIC RECORD.

VOL. II. MARCH, 1893. No. 9.

THE PATHOLOGICAL ANATOMY OF CHRONIC INFLAMMATIONS OF THE CONJUNCTIVA.

BY JULES MUTERMILCH,

Translated from Annales D'Oculisteque, for the Ophthalmic Record by

M. F. WEYMANN, M.D.,

ST. JOSEPH, MO.

The investigations concerning chronic inflammations of the conjunctiva present a chaos in a surprising degree in contradiction with the precision characterizing ophthalmology. Even a superficial study of this important part of ophthalmological pathology suffices to convince us that the absence of a rational classification, the illogical and unscientific definitions of certain morbid types, and the diversity of opinion on the subject of the so-called trachomatous condition are nothing but the natural consequence of the insufficiency of anatomical research concerning this question.

The pathological anatomy of inflammatory affections of the conjunctiva has been the subject of a great many investigations.

The work of Raehlmann, doubtless, is the most complete, but that author, as all the rest, made the serious mistake of carrying out his anatomical researches without uniting them with precise clinical observations.

The anatomist certainly does not understand well a microscopical preparation, unless he knows exactly the clinical signs accompanying the modifications which the tissue under examination has undergone.

On the other hand, the clinician only renders account to himself, those of the signs observed in his patient which concord in his mind with corresponding anatomical appearances.

With this principle in view I have concluded to follow the enumerated rules in my researches.

1. To observe only patients who have never been treated or, at least, who have discontinued treatment a sufficiently long period. I have considered this condition as a necessary one, for this simple reason that all treatment, especially, as may happen, a badly chosen treatment, does not alone modify the macroscopic aspect of the tissue, but possibly also their anatomical characters.

2. To note all macroscopic alterations that the observer can perceive about the conjunctiva together with the objective and subjective state of the patient.

3. To direct, in all cases, attention to the cornea, concerning the kind and the location of pannus.

4. To excise small particles of tissue necessary for microscopic examination, always from the same portion of the conjunctiva, either from the surface of the cul-de-sacs or, perhaps, at the border of the tarsal cartilages and the cul-de-sacs.

5. To have in view, in every particular case, the mode of treatment.

6. To submit the patient to careful observation as long as possible.

At the moment the patient's condition improved perceptibly, I suspended the treatment and, after some days of rest, I examined microscopically a second portion of conjunctiva excised from the part immediately adjacent to the preceding excision (the first excision, followed by a microscopic examination, took place always at the beginning of the treatment).

Before this little operation I carefully noted all alterations which had occurred on the conjunctiva and the cornea since the treatment had been instituted. Proceeding in this manner I

obtained a series of numerous anatomical and various clinical facts, whose study and attentive comparison enabled me to appreciate easily the value of every material change in the course of the disease. Besides, it became easy for me to distinguish constant and typical alterations occurring in all cases from those which were accidental and of less importance. I endeavored principally to find the pathognomonic pathological characters, i. e., those which manifested themselves, and disappeared, at the same time as the principal clinical signs, and re-occurred in every particular case and developed in direct relation with the intensity of the morbid process.

The result of my investigations is that the *"follicles" do not belong, by any means, to this kind of anatomical signs. Those productions have almost no importance in the pathology of the conjunctiva and it is only through superficial and unsystematic researches that they have been brought to prime importance.

It is Dr. Kramsztyk who first made a serious attack on the follicular theory. In his work about the relation between trachoma and pannus that author has proven that pannus, that serious complication of trachoma, was in no way in connection with the macroscopic aspect of the conjunctiva. Pannus is, without a doubt, the expression of a slow phase of the morbid process having for its seat the palpebral conjunctiva; hence, if the production of follicles and papillæ were the essential fact in the material alterations of the conjunctiva, we should expect to see a direct relation between the extent and the density of pannus on the one hand and between the degree of development of those pathological formations on the other. Now, according to Kramsztyk, no such thing occurs. Basing his view on numer-

Remark: The term follicle is here used as a synonym for granulation, granulation body, trachoma body, trachoma kernel, granulation follicle, trachomatous follicle. It is taken from the pathological teaching, adhered to even now by many able pathologists, that a granulation is merely a distended lymphoid follicle of the conjunctiva. The fact that such a granulation is a spheroidal mass of lymph-cells surrounded by a capsule showing, in many cases, delicate fibres passing radially to the center makes them anatomically equal to a regular lymph follicle.

TRANSLATOR.

ous observations, that clinician rejects completely this relation, and my microscopic examinations only confirm his opinion.

The only constant anatomo-pathological phenomenon accompanying all chronic inflammations of the conjunctiva and being, at the same time, the cause of the production of pannus, the only characteristic sign which can serve as a starting point of a rational classification, is the alteration of the epithelium.

The changes producing themselves in that important part of the conjunctiva are so interesting and manifest themselves with such a precision that it is really difficult to explain why the many authors who have examined into the pathological anatomy of the conjunctiva have given them so little attention. Microscopic preparations, which represent different stages of chronic conjunctivitis, offer a beautiful example of the struggle for existence which the epithelial cells have to undergo. We can follow in such preparations, step by step, the various phases of that struggle: the moment when these little cells, threatened in their existence, begin to proliferate energetically and so increase their forces necessary for the defense; the moment of defeat, when the places occupied so far by the epithelium become deserted and are covered with the rest of the conquered cells, while the elements having escaped the disaster retire from the battle-field into the depth of the tissues, awaiting there more favorable circumstances for their return to the surface of the conjunctiva and, finally, we witness the victory of the epithelial elements, the vigorous multiplication of the cells and see them moving back again into the places temporarily abandoned.

There exists a constant relation between clinical manifestations and the appearance of the epithelium. Every form, or rather every phase of a chronic conjunctivitis, is always accompanied by the same pathological process in the epithelium. With a little practice, one becomes enabled to read easily on the microscopic preparation the actual subjective and objective state of the patient, and vice versa.

Before giving a detailed description of the changes in the epithelium, I consider it useful to say a few words about its normal appearance.

We find any number of different opinions, in science, about

the epithelium of the palpebral conjunctiva in its normal state. All varieties are here represented except that which really exists. We easily understand this diversity of erroneous opinions, if we remember how difficult it is to observe a conjunctiva of which the physician can say with certainty that it is absolutely normal and has never been diseased. We are often consulted by patients complaining of typical phenomena which leave no doubt as to the existence of a conjunctival catarrh and still the conjunctiva on inspection looks perfectly healthy; and, on the contrary, we can observe individuals who believe themselves absolutely well in spite of a certain redness of the conjunctiva, the latter being slightly swollen and covered with small papillæ or even follicles.

On the other hand, changes following light forms of inflammation disappear on the cadaver, the desquammation of the epithelium coming on so rapidly. All this only increases the difficulty to obtain, in *this* manner of anatomical examination, a normal epithelium.

The cases in which we can use the conjunctiva of an absolutely healthy person are, as we can readily imagine, very exceptional.

I have, therefore, first taken up the study of the conjunctiva of the rabbit, then, having had occasion to examine also the conjunctiva of the superior and inferior cul-de-sacs of a 16 year old boy, perfectly healthy, I noted that the result of those examinations enabled me to identify completely the two mucosæ.

On the surface of the cul-de-sac the epithelium is composed of three or four layers. The superficial layer contains almost exclusively mucous "corpuscles," fairly large, which in their appearance approach goblet cells. They are round or oval, slightly elongated in the horizontal direction, less frequently conical. The outlines of these corpuscles are quite sharp, their protaplasm finely granular; their nuclei are eccentric being closer to the deeper border. In the second layer the mucous-cells are less abundant. Near these latter elements we find round epithelial cells whose protoplasm forms a narrow ring around the nucleus; these are the young elements which give birth to the mucous cells; it is not difficult to observe intermediate forms among them all. The intermediate cells which fill

the interstices between the mucous corpuscles of the superficial layer appear in form of triangles in a section. One of these angles, less acute than the others and containing the nucleus is turned towards the depth of the tissue. The other layers, more deeply situated, contain almost exclusively young cells. One notices sometimes narrow fissures in the epithlium which are rather long and parallel to the surface of the conjunctiva: they are filled with grains of different size These vacuoles result probably from the rapid destruction of a certain number of mucous cells or are due perhaps to a retarded development of young elements.

In the prolongations which the epithelium sends into the subjacent tissue and which I have seen only in the upper lid, the cells arrange themselves most usually in two layers of which the inner is composed of cylindrical cells, the outer of round cells. Immediately beneath the epithelium there is adenoid tissue composed of loose cellular tissue infiltrated with leucocytes. In the rabbit the conjunctival epithelium presents the same structure.

I. At the beginning of a chronic conjunctivitis, when we have to deal with the so-called catarrhal forms, but when the cornea is still perfectly sound and not even threatened, the conjunctiva is slightly reddened and only presents a few transparent follicles (principally on the lower lid) and the epithelium differs very little from its usual appearances. The difference lies in the circumstance that the mucous corpuscles develop with a greater energy than in the normal stafe, but the rapid development of these elements and the increase in their function, namely the production of mucous, brings about their destruction before they reach their full maturity Most of them have a conical form. The elongated extremity contains the nucleus and inserts itself between two cells of deeper situation. They are usually smaller and approach in their appearance the intermediate forms. The young epithelial cells, likewise, multiply and come to the surface of the conjunctiva, to the points where the row of mucous cells is broken. It goes without saying that the thin layer of normal epithelium, in consequence of the more active prolifera-

tion, thickens and becomes more marked on a transverse section of the conjunctiva.

Ordinarily we find in the sub-epithelial tissue a certain degree of infiltration, diffuse, or disposed in form of follicles.

The leucocytes penetrate between the epithelial elements; in some places they are quite numerous. If one wanted to judge about the clinical condition of the patient with reference to the changes observed in the sub-epithelial tissue, one would readily fall into an error by taking this light and first degree of inflammation for a serious form. It is sufficient for the correct appreciation of the character of this disease, to examine more carefully the epithelium and then it will be noticed that it forms on the conjunctival surface an almost uniform and continuous layer and, what deserves particular attention, that it preserves its character, its normal type.

Restitutio ad integrum of the epithelium is, in this case, possible, as we know from clinical observation. We can expect it, considering the slight change of the elements.

II. When there exist conditions favoring the progressive march of the pathological process, the round cells become incapable of transforming themselves into mucous cells. In place of the layer represented by the mucous cells we find elements which have no determined form, they do not stain and do not contain nuclei, or else we see there a considerable quantity of granules more or less voluminous; all this represents nothing but the rests of degenerated mucous cells. The other elements are little modified, their nuclei are slightly swelled and take up less coloring matter.

Occasionally the follicles are so abundant in this phase of inflammation, that they are almost run together in one mass in which it is difficult to distinguish the outlines of the individual follicle. The leucocytes are found in large quantity in the epithelial layer, whence they penetrate into the conjunctival sac. The clinical manifestations of this morbid form, characterized principally by the destruction of the superficial layer of the epithelium, notably of the mucous cells, are not many. The cornea stays intact, in spite of the crowded follicles on the conjunctiva. Suppuration is little marked, the patient complains

of no suffering and often does not even consult the physician until the conjunctiva, thickened by infiltration, has caused a narrowing of the palpebral fissure (ptosis). Strictly speaking, it is an intermediate phase uniting in one evolutional stage the most simple catarrhal inflammations as well as the different forms of trachoma.

III. We must look for the most essential modifications of the epithelium in those forms of chronic conjunctivitis, which often last for years and are complicated as a rule by pannus (trachoma folliculare, mixture, papillare, infiltratio trachomatosa). Here the follicles occur more or less abundantly, sometimes gross appearances do not show any; sometimes even, as I have seen, a certain number of cases which every physician would certainly take for the most serious forms of trachoma (duration of the disease, pannus sarcomatosus), do not present one follicle in the preparations taken from the surface of the cul-de-sac and the tarsus. It is possible that those productions *had* existed at the beginning of the affection and that they had disappeared little by little either by absorption or in some other manner. However that may be, the fact that the disease may progress without the presence of follicles destroys their pathognomonic value.

Their abundant accumulation on the conjunctiva, (which we must not consider as a peculiar variety of inflammatory infiltration, but as a secondary and not primary manifestation), exercises, no doubt, an injurious influence on the neighboring tissues, probably determining circulatory disturbances and thickening of the conjunctiva. We here encounter a phenomenon of comparative frequency in the organism, i. e. the reaction, coming to defend an organ or a threatened tissue, passes over the necessary limits and, perhaps, becomes injurious by giving rise, as in this case, to an exuberant and exaggerated growth. Still there does exist a certain relation between the quantity of follicles and the phase of inflammatory action, namely a relation exactly opposed to that which has been admitted up to this time.

This relation reads thus: the more the disease progresses and the more it is liable to (aggravations) exacerbations, the smaller is the number of follicles. This can be explained by the fact that inflammatory infiltration in loose cellular tissue most

frequently takes a spherical form (acts in spherical foci). Repeated and long exacerbations, a frequent thing in chronic conjunctivitis, render the tissue denser, consequently less favorable for the production of follicles. In all those grave forms of trachoma it is only in the epithelium where we find constant changes developing in the upper layer and localizing in the layer of round cells.

The mucous cells, as we have just remarked, are destroyed first. According to the intensity of the respective affection, the etiological factors and individual properties of the tissue, or the hygienic conditions, the destruction of the cells progresses more or less rapidly and finally ends by a complete disappearance of the conjunctival epithelium. This process takes place progressively and does not invade the whole extent of the conjunctiva at the same time. In places we may still find a pretty thick layer of larger cells, which appear almost as one mass, owing to their indistinct outline and hyaline protoplasm. Some of these cells do not contain any nucleus at all, in others they stain very lightly. This epithelium often presents more or less extensive vacuoles filled with granules or leucocytes. The surface of the conjunctiva appears in certain places entirely deprived of epithelium, still a more careful examination easily allows us to prove in the mass of leucocytes epithelial cells elongated in the horizontal direction, producing the effect of corneous cells containing no nuclei and accepting no stain. In certain spots where the layer of these elements is a little thicker, the observer can find some cells which have not undergone a complete degeneration and are prominent (perceptible), owing to their ability of absorbing stains. As the disease goes on, the epithelium disappears more and more, and finally there remains only a thin "lacuelle" in the conjunctival surface with very distinct outlines coming from the fusion of degenerated elements.

The epithelial prolongations, which in their structure resemble tubular glands are formed in considerable quantities in a conjunctiva affected with a chronic inflammation, and penetrate deeper into the tissue than in the normal state. Their form and dimensions differ. Sometimes they unite and form complicated figures. Some of those pseudo-glands possess no lumen, while in others it may assume considerable dimensions.

The deep part of those prolongations is usually the larger, which gives them the form of balloons or a resemblance to the neck of a bottle. The enlarged extremity may be closed off and transformed into a sort of cyst, which fills itself with desquamated cells, having undergone fatly degeneration, and then they may increase in size until they become visible on a section to the bare eye. When the cells of the superficial layer are completely destroyed those of the prolongations begin to change, but *the pathological process only touches the cells nearest to the conjunctival surface, those of deeper location remaining normal during the whole course of the disease.*

What is it that causes the epithelium to bury itself in the sub-mucous tissue in form of those numerous prolongations, and why is it that the cells remain normal only in the final (terminal) ramifications, even in the most severe forms of inflammation?

The advocates of the follicular theory of trachoma cannot give a satisfactory answer to those questions. These facts prove in an indisputable manner that the epithelial layer covering the conjunctiva plays an important role in inflammatory affections and that it is that part which is the most important, if not the only, seat of the disease. The more distant the cells are from the conjunctival surface, the less they are threatened, the more chance they have to retain their normal characters and thus to form the source which, sooner or later, in favorable circumstances will give rise to a new epithelial lining covering the denuded conjunctiva. Another proof in favor of the epithelial theory is furnished us by the formation of papillæ, which is a significant manifestation of the resistance of the cells and their very active proliferation. These papillæ are formed by the prolongations which the epithelium sends downward, a fact easily verified on microscopic sections. The epithelial cells which cover the papillæ undergo all the progressive transformations which I have described above and which here, as elsewhere, correspond to the intensity of the disease.

Hence, according to constant and characteristic alterations which we observe in the epithelium, we can divide the chronic inflammations of the conjunctiva into three groups.

The first comprises the catarrhal forms, where the function of

the cells with reference to multiplication and the production of mucous is considerably increased.

The second category is made up by the forms characterized by the destruction of mucous elements.

To the third there belong the grave inflammations which, although fairly well held apart by macroscopic signs, are easily grouped under one head, owing to one characteristic common to them: it is the complete, or nearly complete, destruction of all epithelial elements on the surface of the conjunctiva and the manner in which these same elements behave in the depth of the tissue.

We do not have here a classification in the true sense of the word, for all those forms are derived by successive development from one another; in certain cases we can observe the simultaneous existence of different forms, because the pathological process does not invade the whole conjunctival surface at the same time. Moreover, even clinical observation shows us that several individuals (for instance several members of the same family who were infected by the same morbid agent) do not always present the same changes in their conjunctivæ, a fact which explains the different resistance of the tissues.

We must distinguish among the chronic conjunctivitides not only the separate forms, but also the phases of one and the same disease.

1. Stage of proliferation.
2. Stage of superficial destruction.
3. Stage of total destruction.

It is difficult to point out the clinical signs which distinguish the first stage from the second, with the exception of a quantitative difference in the macroscopic aspect. *The beginning of the third stage is typical, it shows itself mainly by a serious complication on the part of the cornea, namely pannus*, which increases as the destruction of the epithelium goes on. It occupies the upper half of the cornea, if it is only the upper lid affected by the disease, and it extends over the whole cornea if both lids are diseased.

The constant subordination of the condition of the cornea to that of the epithelium of the conjunctival surface is a very im-

portant fact which explains to us certain obscure and incomprehensible phenomena often observed in treating patients affected with trachoma. Thus we readily understand why pannus of the cornea is not in direct proportion with the gross changes in the conjunctiva, assuming sometimes a very serious character (pannus crassus) when the conjunctiva only shows a small number of follicles and papillæ or even offers a perfectly smooth surface, and on the other hand, retaining a surprising mildness (pannus tennis) in spite of considerable macroscopic alterations of the conjunctiva. We understand also why, if we limit ourselves only to the conjunctiva, the pannus begins to disappear before the apparent resorption of the follicles and the diminution of the size of the papillæ and finally why the actual methods of treatment of trachoma complicated by pannus are in the end very efficaceous which, *a priori*, might appear contrary to the accepted principles of therapeutics. *

Under favorable circumstances the regeneration of the epithelium takes place rapidly, even when we have to deal with considerable anatomical changes. Hygiene is a powerful ally of the physician in the warfare against the destructive process of the epithelium. I have known many patients belonging to the poor class in whom the reproduction of the epithelium went on very slowly as long as they were treated in the out-door department of the hospital: the same remedies employed in these persons during their stay in the hospital produced rapid improvement. We can easily understand how the return of the epithelium is brought about if we remember that the solution of argentic nitrate, sulphate of copper and other medicaments hasten the mortification and the dropping off of the superficial layers. We thus approach, little by little, the epithelial cells imprisoned in the depth of the tissue, where they have not lost their

* It is the rule in therapy to remove the cause of the disease, or its manifestations, when the first condition is unrealized. Thus it might be surprising that the physician obtains the best results by cauterizing lightly the conjdnctival surface, which is without significance to the follicles and papillæ (so-called cause of the affection) and cannot have any action directly on the pannus, which is the most serious manifestation of the disease.

physiological properties and are ready to take a favorable surface prepared for them.

After the destruction of the diseased layers by means of the proper and moderate application of our therapeutic means we excite the proliferative faculties of the epithelial cells which rapidly re-cover the conjunctiva, and that with a thicker epithelium than in the normal state. *At this new phase of the disease (stage of regeneration) the pannus begins to disappear.* The type of epithelium at this stage is variable and depends on former condition of the conjunctiva. If the destruction was superficial only, the regenerated epithelium is composed of several layers of cells (6 to 7) which resemble the mucous cells, reminding us of the incompletely developed elements observed in chronic catarrh. The more advanced the destruction and the longer the duration of the pathological process, the more pronounced becomes the epidermoidal character of the new epithelium. The superficial cells assume a flattened form, the deeper come more and more into resemblance with the cylindrical form. The final result of the epithelial metamorphosis is the epidermoidal form, characterized by an almost general transformation of the cells into the corneous type except the deep or fundamental cells, which remain cylindrical.

When the regeneration is little active, only a thin film of epithelial cells is formed which are subject to a repeated degeneration, thus producing vacuoles. If, during treatment, the patient remains long under unfavorable circumstances the degenerated epithelial cells are lost in the mass and the conjunctival surface becomes then covered with a mass almost fibrous, in which sometimes the observer cannot recognize the outlines of the elements.

Along with those important changes in the epithelium there occurs a series of phenomena of secondary value, but great theoretical interest, namely the formation and disappearance of follicles and papillæ, the new formation of lymphatic vessels, the production of conjunctival cicatrices, the modifications occurring in the glands, and finally trichiasis.

FORMATION, DEVELOPMENT, DISAPPEARANCE AND REGENERATION OF THE FOLLICLES.

In the examination of the follicles I did not only consider the study of their form and their intimate structure, but I also endeavored to account for the question by far more important, "how and why are those strange productions formed?" In order to solve these interesting questions, it seemed insufficient to me to study only the chronic conjunctivitides: consequently I also took up the acute forms, trying in this manner to understand the first moments of the existence of the follicles, in order to follow, subsequently, their progressive development. I have attached the results obtained in this manner to those of the anatomical examination of chronic forms, hoping that this combined method would allow me to secure a satisfactory answer to the questions which occupied my mind.

Whenever under the influence of morbid agents, most frequently those of parasitic origin, the conjunctival epithelium begins to undergo characteristic inflammatory changes, there manifests itself immediately on the part of the organism a defensive reaction, which shows itself by the migration of white blood cells into the sub-epithelial tissue.

The microscopic examination of the conjunctiva during the first days (2 to 4) of the acute inflammation allows us to see how the white blood cells leave the small sub-epithelial vessels and how they crowd around each other in quantities more or less considerable in order to pass subsequently toward the epithelium being threatened in their existence; at the end of several days they form underneath the epithelium a layer of inflammatory infiltration. Between this layer, on the one hand, and the larger vessels forming a net work relatively far from the epthelium, on the other, the cellular tissue remains little infiltrated: the white cells only pass through it, without stopping, in order to reach the conjunctival surface. These elements pass in considerable quantity into the interstices of the epithelial cells, whence they are soon eliminated into the conjuntivalsæ.

What is the role which this army of white cells so well organized accomplishes? The circumstances favoring their emmigration, often of a purely mechanical nature, prove that function is not alone limited to phagocytism; the white cells probably also absorb the products of regressive tissue metamorphosis and then, being destroyed, in their turn, furnish nutrition to the diseased tissues. At all events, it is not doubtful that the white cells fulfill in the inflammed tissue an important and complicated mission, which exhausts their vital forces and it is for that reason that a certain number of them die before being eliminated outward or before re-entering the circulation.

An attentive examination of the mass of cells making up the inflammatory infiltration allows us to notice that all cells do not stain alike. Cells which absorb less coloring matter, or none at all, are often larger and do not possess a well-limited nucleus; Those are, without a doubt, elements already attached in a certain measure by the degenerative process and, consequently, unable to carry out their amœboid movements. The quantity of cells having left the vessels and the extent of the strip of inflammatory infiltration is proportional to the intensity and the duration of the inflammation. The elements situated at the periphery of infiltration absorb more readily the oxygen necessary for their life and movements from the neighboring tissues and it is for that reason that they retain their normal characters for a longer time. The white cells near the center are in less favorable conditions and, therefore, undergo degeneration more rapidly.

The circumstances which especially influence the vitality of the lymphatic cells are certain general properties of the organism and the hygienic conditions under which the sick person exists.

In the so-called lymphatic subjects, as well as in those whose organism is exhausted by certain constitutional diseases or insufficient nutrition, the oxydation of the tissues is very poor; as a result the vitality of the white cells is quite feeble and they rapidly loose their amœboid movements, when once they have left the vessels. Nor is there anything astonishing in this, because we know that these movements take place only in tisssue

supplied abundantly with oxygen. In those cases where for one reason or another the organism finds itself in unfavorable circumstances a large quantity of lymphatic cells undergoes changes and then, by reason of the inflammatory infiltration there are formed islands composed of these degenerate elements. *The grouping of white cells in foci is favored by the structure of the loose cellular tissue, adenoid in nature, and situated beneath the epithelial layer.*

In the meshes of this tissue we find, even in the normal state, lymphatic cells in pretty large quantities.

The isolated degenerated cells, or rather their islands of small dimensions, undergo easily regressive metamorphosis or absorption, and after the extinction of the inflammatory process we no longer can find a trace of them in the tissues.

But, when owing to conditions mentioned heretofore, the degenerated cells are more numerous and give place to larger foci, it is evident that rapid absorption can no longer take place. The cells swell and run together into an almost uniform mass, well marked off from the neighboring tissues. Thus the first nuclei of future follicles are formed. In following these nuclei further along we see that they always behave in the same manner toward the surrounding tissues and that they are subject to typical and constant metamorphoses, which may be divided into two phases; the first comprises a series of phenomena, positive phenomena so to speak, giving to the nuclei the characteristic appearances of developed follicles; the second presents a regressive, negative character, determining the disappearance of these productions. If we remember the experiment of Ranvier (Traité techniqued' histologie), with a piece of marrow of elder-bush introduced under the skin of a frog, proving that the lymphatic cells easily traverse a spongy body, we can indeed understand *à priori* how a small group of degenerated leucocytes transforms itself into a typical follicle. The normal white cells lying at the periphery of the follicular nucleus situ can easily pass into its center; in that case they behave as they would toward a foreign body whose consistency does not offer any obstacle to their amœboid movement. We observe exactly the same thing in the conjunctiva, and, besides, the lymphatic cells

share with the follicular nucleus the same relation as we observe between the white cells and the elder-marrow spoken of; that is, in the peripheral parts of the nucleus we see an accumulation in large quantities of normal cells. The more we approach the center, the fewer the normal elements, since these must of necessity die there on account of the insufficient supply of oxygen, or its complete absence. The islands of degenerated elements or follicular nuclei do not always offer the same appearance; their volumes as well as their forms are variable, the borders are always poorly marked. These differences are evidently in proportion with the quantity of degenerated lymphatic cells, that is, with the general condition of the patient and the amount of inflammatory infiltration. We can easily distinguish these productions in the mass of lymphatic cells owing to the fact that they are exclusively composed of degenerated elements and consequently take up less stain than the others. The follicular nuclei become more apparent whenever they are on the way of transformation to the fully formed follicles, because then the peripheral layers stain in a more pronounced manner than the center and are composed of cells crowded more densely against each other.

We then find them in the midst of adenoid tissue more or less approaching the epithelial layer and under a weak magnification (oc. 3, obj. AA Leitz). They produce the effect of small patches well marked off on the ground of inflammatory infiltration. A stronger magnification (oc. 3, obj. DD Leitz) shows more distinctly that the center of every patch contains almost nothing but degenerated elements differing considerably in their size and in the staining of peripheral elements. The nucles of these productions becomes more and more considerable and, as these cells are invaded by the degenerative process, it is transformed into a uniform mass, almost half fluid, and approaches more and more the spherical form, owing to the equal pressure exerted from all sides by the surrounding tissues.

Hence the individual characters of the organism, the special attitude of the lymphatic cells in their relation to a foreign body of certain consisteney, and finally, the anatomical structure of the sub-epithelial adenoid tissue, represent the only conditions favoring

the production of follicles in all inflammations of the conjunctiva. A follicle stained with hæmatoxyline takes a characteristic appearance, since its peripheral parts, containing a lot of normal cells, are stained more distinctly than the central parts composed principally of degenerated elements. Still, as we shall see further on, this appearance changes as the follicle passes from one phase of its existence to another.

When the morbid process, having attacked the epithelium, begins to diminish, the quantity of white cells eliminated from the vessels into the tissues also becomes less, dwindling down to a minium at the moment when the inflammation disappears. The migration of the leucocytes does not cease completely, since it takes place to a certain degree even in the normal state. The white cells which have retained their amœboid movements are taken up by the lymphatic passages and thus returned into the circulation: the isolated degenerated elements are also removed, being easily absorbed and, finally, nothing remains in the sub-epithelial tissue but the islands of degenerated cells, as last trace of the extinct inflammation, forming with the normal elements, which are detained principally around the peripherial layers, what is wrongly called a follicle. These productions have nothing in common with the true lymphatic follicles, neither in respect to their origin nor their structure. When the resistence of the white cells is very small, the quantity of follicles may be so considerable that they almost fill completely the sub-epithelial tissue and are then fused into an almost continuous chain. The growth of the follicles is influenced in the following manner by the exacerbations of the disease which gave birth to them: the elements situated at the periphery undergo in the course of time the same regressive metamorphoses as those of the nucleus, with which finally they become fused. At the same time new normal lymphatic cells are heaped up around the nucleus and undergo, in their turn, degeneration for reasons easily understood, and so on. Still we easily understand that the dimensions of the follicle cannot pass beyond certain limits: the reasons are as follows: When a follicle, which always takes origin in the adenoid tissue situated immediately under the epithelium, reaches the deep layers of the conjunctiva, it finds there a serious

obstacle to its growth. The sub-jacent tissue is more compact owing to the abundance of bundles of connective tissue crossing in all directions and thus forming a close net-work. Now, this mesh-work is little favorable to the development of the follicles for it yields very little to the pressure exerted upon it and that not even without a distinct re-action. The connective fibres of the tissue in question, irritated by the follicles, insert themselves between them and pass through a whole series of transformations; they thicken, become fused, and finish in sclerosis.

These phenomena are observed everywhere in the fibers nearest to the follicle and result in the production of a sort of hyaline cupule, distinctly marked off and surrounding the follicle on the side towards the skin. Consequently, a barrier is formed at this place arresting the new elements in their migration so they can no longer come to join the follicle, the latter ceasing to grow in that direction. Stained with hæmatoxyline it takes an appearance distinctly different from those follicles which do not stay in the tissue so long and have not yet reached the deeper parts of the more compact connective tissue.

In these latter forms normal elements surround the whole periphery and form a complete ring, staining more heavily.

On the other hand the section of an older follicle offers a crescent of normal lymphatic cells embracing the nucleus on the side of the epithelium. Not finding any obstacle to its development in the direction of the epithelium, the follicle approaches more and more the conjutival surface and, as result, a progressive atrophy of the epithelial cells covering it takes place; thus toward the end, the least traumatism is sufficient to rupture the epithelial layer and a part of the follicular contents having undergone almost complete liquefaction, may escape outward. That the follicle can never empty itself entirely in this spontaneous manner I know from miscroscopic examination. The following observation proves it in an incontestable way.

In a case of chronic follicular conjunctivitis the conjunctiva was crowded with follicles, running together in places. They were squeezed out by means of the forceps by Dr. Kramsztyk. *A priori*, we expected an absolutely favorable result from this method, and it was thought that not even a trace of follicles

would remain in the conjunctiva. Now, at the end of two weeks, in spite of a completely smooth appearance of the conjunctival surface, the microscopical examination showed a quantity of follicles not less than before. Although smaller than those before, they nevertheless existed for a long time in the tissue. The presence of connective tissue in their inner layers was evidence of it. Hence, we see that the forceps only squeezed out the central, softened part which subsequently was replaced by connective tissue of new formation: this furnishes another reason compelling us to admit that in a spontaneous manner only the soft part of a follicle, being half fluid and occupying the center, could evacuate itself. All the rest remaining in the thickness of the conjunctiva is in so intimate connection with the tissue that no mechanical means could detach it.

Some authors think that the denuded follicle after the evacuation of a certain part of its contents does not cover itself over again with epithelium and forms at the conjunctival surface a sort of well-marked ulceration, which progressively destroys the follicular débris and transforms itself finally into a cicatrix. We shall come back in the course of this essay to the question of conjunctival cicatrices: for the present we will only say that the pretended ulcerations which we see on microscopical preparations are produced at the moment of excision of the fold of conjunctiva necessary for the examination. The light pressure, which is unavoidable in such cases, suffices to break the continuity of the epithelium which covers the follicle and a certain quantity of its contents escapes. Moreover, inversion of the lid alone may be sufficient for the partial expression of the follicle, as we can easily convince ourselves in every case. These are the causes, which create on microscopic preparations, pictures resembling ulcerations.

The etiology of the follicles shows sufficiently that they require a certain time for full development and that they can not appear the first day of the inflammation. Still, we sometimes observe patients at the first day of an acute conjunctivitis who deny ever having had an eye-disease, and yet present a considerable number of large follicles. We must not trust these assertions of the patients. Clinical experience shows that

follicles can remain a long time on the conjunctiva without causing any subjective sensation. This fact is proven by the following observation, by no means exceptional.

A patient came to consult me for an acute conjunctivitis of two days standing. Conjunctiva showed a large number of enormous follicles running together in places. The patient claimed that he had never been sick and that his other eye was sound; still examination showed that the so called sound eye was crowded with follicles, although not inflamed.

Among my clinical observations, which I have often joined with anatomical examinations answering to precise scientific demands, one can draw certain conclusions. I report one, for they all resemble each other.

A young girl of 12 years, who had always been healthy, had been sick for four days. She probably was infected by her younger brother suffering since two weeks with a purulent conjunctivitis in the left eye; palpebral conjunctiva infiltrated, perfectly smooth, and without a trace of existing follicles.

In the right eye the conjunctiva of the upper cul-de-sac is also infiltrated; careful inspection shows there some grayish points of excessive smallness and hardly projecting above the surface. Purulent secretion considerable, lachrymation and photophobia on both sides Anatomical examination of these points shows that they only present the first occasional nuclei of future follicles. During the following ten days the affection diminished visibly after washes of the conjunctiva with corrosive sublimate. Patient stops treatment. At the end of three weeks she comes back with a fresh exacerbation having lasted several days: follicles were then seen easily on both lids.

This observation, as other similar ones, entitles us to the belief that during the first days of inflammation there my be formed follicular nuclei only; when conditions are favorable, they are transformed into full follicles and become apparent.

From the first moments of their existence the follicles are the seat of two processes entirely opposite in nature: continual absorption (attraction) of lymphatic cells from the neighboring tissues on one hand, resorption of these regenerative elements on the other. The first of these phenomena predominates at

first, the follicles increasing in size. Towards the end the migration of white cells is reduced to a minimum. Now it is the resorption which exceeds absorption (attraction). If the follicle has the capsule on the side of the skin, it now loses it, since it ceases to exert pressure on the neighboring tissues, which was the case during its growth. The lymphatic cells become more and more rare and are replaced in like proportion by cellular tissue.

The outlines of the follicles become less distinct and are recognized only by their presence in the midst of a tissue deprived of cellular infiltration. Finally the follicles disappear without a trace. This disappearance is gradual and may last for years. I have found follicles in the process of resorption long after the inflammatory action had ceased.

Suppose a new exacerbation comes at the moment when the follicle has undergone only partial resorption. What will happen? If the exacerbation comes at the beginning of the disease when the adenoid tissue has not yet been modified a great deal nor lost its anatomical characters, the follicle is in the same, or nearly the same, conditions which were favorable in the first place to its evolution, and it will easily come back to its first appearances. The thing is different, when the sub-epthelial tissue has lost its distinctive characters and been transformed into compact cellular tissue. Here the follicle does not increase or, at least, very little on account of the capsule, which surrounds its entire periphery, and developing at the expense of the connective tissue which limits the follicle on all sides in this advanced stage of the disease. On the other hand, connective tissue now replacing the contents of the follicle is no longer distinguished from the surrounding cellular tissue and also opposes the accumulation of lymphatic cells. The pressure sustained by the capsule is little and it is for that reason that its fibres no longer undergo transformations which we observed in the capsules of young follicles during the period of growth. They do not run together and are frequently disposed in a concentric fashion, the lymphatic cells passing outward and often forming regular rows between these fibers.

During the stage of re-formation the follicles are not distinctly visible on the plain of inflammatory infiltration, their outlines run together with the mass of lymphatic cells and often we cannot recognize them, except by their characteristic nuclei.

Oculists have made use of the particular appearance of these follicles in making them pathognomonic signs of trachoma and considering these productions as having nothing to do with the follicles developed during acute forms.

This erroneous opinion is the result of unsystematic and superficial anatomical studies. *Rejecting the existence of follicles of different origin we at the same time overthrow the base on which is founded the theory of trachoma as an independent affection.*

IRIDECTOMY NECESSARY TWELVE AND FOURTEEN DAYS AFTER NORMAL EXTRACTION OF CATARACT.

Written for the Ophthalmic Record by

PETER D. KEYSER, M.D.,

Philadelphia, Pa.

It is the desire at the present day of most operators to make cataract extractions without iridectomy, although the iridectomy with or previous to the extraction is advocated by many experienced ophthalmologists; and I am sure that every busy practitioner runs across cases in which he finds it necessary to remove a piece of the iris at some time of the operation, especially when prolapsis takes place immediately at or very soon after the extraction, and cannot be replaced by the action of eserine or the gentle manipulation with the spatula, etc. Prolapsis generally takes place during the first twenty-four hours

after the operation, but I have had it to occur after thirty-six to forty-eight, and I wish to record two cases in which extraction was made without any break or mishap, that did well for some days when a small opening in the corneal incision took place from some unknown cause, allowing the iris to prolapse, at first but little and then gradually enlarged causing very great distortion of the cornea.

Mr. Henry M., æt. 74, came to my clinic at the Wills Eye Hospital July 2, 1892, with cataract R. E. Not operating in the hot weather he returned in Sept. On the 24th of that month I made extraction without iridectomy. Iris contracted normally after the removal of the lens and everything went well. Next day eye looked well, iris in good condition and position. On the third day the pupil was a little irregular in form, being slightly drawn up, but the wound of the cornea appeared adherent and healing. Fourth day a small pigmented spot was showing in the outer angle of the corneal incision without any irritation or pain. This continued without change until the tenth day after the extraction when it began to enlarge and draw the pupil farther up. All this time there was no pain nor special increase of inflammation. On the fourteenth day the iris had prolapsed along nearly the whole line of the corneal incision, but at the same time was adherent to the cornea. The cornea became very much bulged out and distorted. The media clear. Vision good. To permit the cornea to come to a more natural curvature, iridectomy was made. The iris being firmly attached to the edge of the cornea, it was first carefully cut therefrom with a cataract knife, then drawn away and cut off with the scissors. The eye healed well, cornea flattened more, and on Nov. 8, Vision with + 10 D. ⌒ + 2.5 D. cyl. 180° was $\frac{6}{15}$.

Mr. Geo. S., æt. 45, cataract both eyes. Was admitted into Wills Eye Hospital Nov. 4, 1892. Nov. 8, extraction R. E., no iridectomy. All went well. First twenty-four hours eye in good condition. On second day without my order or knowledge atropia was instilled into the eye which widely dilated the pupil. On the third day a very small prolapse was noticed which remained in this condition until the seventh day when it began to gradually enlarge along the line of the corneal incision. The

whole change was spontaneous as no cause could be found for it. On the 20th, twelve days after the extraction, made iridectomy to relieve the great irregular curvature in the cornea which had taken place. Healed well and vision is, + 11. D. ⊂ + 2.5 D. with cyl. 145°, $\frac{6}{15}$.

Dec. 1, 1892. Extraction L. E, no iridectomy. All did well this time. No atropia used. Dec. 17, vision with + 11. D. ⊂ + 2.5 D. cyl. 180°, $\frac{6}{15}$.

These two cases are instructive in so far as they show that an eye operated on without iridectomy is not relieved from the danger of prolapse of the iris for some considerably longer time than is generally supposed.

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The advertisement of this new and important invention is to be found in this Journal. We have one in use and find it all that is claimed for it. One who has worried over "storage" and "dip" batteries knows best how to appreciate Aloe's Converter.

DR. WEYMANN

Has given us an easy and clear translation of Mutermilch's paper on "the pathological anatomy of chronic inflammations of the conjunctiva." We are sure that all who read this paper in this issue of the *Record* will feel like thanking the author for giving us the results of his pains-taking observations, and the translator for serving to us this valuable information in English.

OPHTHALMOLOGICAL SECTION OF THE PAN-AMERICAN MEDICAL CONGRESS.

On another page of this issue will be found the list of officers, executive, honorary and advisory, of this Section. If President Chisolm excites a *working* interest in all of his official associates the meeting is destined to be a grand one. We

prophesy that a larger number of ophthalmic surgeons will be present at this meeting in Washington in Sept. next than have ever been in one gathering on this continent A goodly number of these will present well prepared papers by which the balance of us will be edified. We hope to be able to give the title and author of the several papers to our readers before-hand, so that they may know the nature of the feast to be spread before them by our President Chisolm

A NEW OPERATION FOR PTERYGIUM.

Perhaps every operator who has had much experience in removing this growth, has now and then seen it return in spite of the care exercised in the operation. It is generally conceded that the return of the growth is due to some part of the ocular conjunctiva attaching itself to the denuded surface of the cornea; and, with this thought in mind, operators are usually careful not to cause the conjunctiva to overlap the cornea when they bring the margins of the conjunctival wound together with stitches. The object of this editorial is to call attention to a little device of our own, as effective in preventing a return of the growth as it is simple in execution. The growth can be removed in any one of the several ways recommended by different operators. This done, our device consists in making a vertical incision above and below, each about $\frac{1}{8}$ inch long and about $\frac{1}{12}$ inch from the most projecting part of the denuded margin of the cornea. The two conjunctival stitches are taken in the usual way for covering the exposed sclera. When these are tied the parts are brought together, without throwing the conjunctiva near the corneal margin into folds. As can be seen, there is the minimum of danger that any of the conjunctiva will become attached to the cornea before it is covered by epithelium.

For the best results in the way of leaving a clear cornea, the corneal part of the pterygium should always be removed by traction, never by dissection.

MUSCLE SHORTENING vs. MUSCLE ADVANCEMENT.

In doing either of these operations on the recti muscles one of the chief dangers to be considered is turning the eye-ball on its antero-posterior diameter, in such a way as to throw unbearable strain on either the superior or inferior oblique muscle. In any of the several operations for advancement there is danger of fixing the tendon in its new position a little too high, thus throwing strain on the inferior oblique, if the muscle advanced be the external rectus, or on the superior oblique, if the internal rectus be the one advanced ; or the point of fixation of the advanced tendon may be too low when the strain on the obliques must be the reverse of that given above. In addition to the danger of "twisting" the eyeball, there is the additional danger that the knots may slip, or the threads may cut the conjunctiva and sub-conjunctiva, before strong adhesions have taken place between tendon and sclera, and thus the divided tendon is pulled back even beyond the point of its original attachment, when the patient's condition will be worse than before the operation. In DeWecker's advancement operation, since the middle fibres of the tendon are not divided these will prevent the tendon's going back very far in case the knots slip or the threads cut. Of all advancement operations DeWecker's is least objectionable, for the reason that the two things to be dreaded are less likely to occur than in all other advancement operations.

Believing DeWecker's operation to be the best of its class, and thinking that some of our readers may not have seen it described, we venture here to give our understanding of the technique of this operation. The conjunctiva is incised vertically over the insertion of the tendon, sufficiently to expose it well. Now the upper and lower two-fifths of the tendon are divided at their insertion, while the middle one-fifth is left uncut. With one needle and one thread the upper divided part of the tendon is advanced, the needle being made to penetrate first the tendon, then the conjunctiva and sub-junctiva above and towards the cornea. A similar stitch is then taken through the divided lower part of the tendon and the conjunctiva and sub conjunctiva below. In tying these stitches sufficient force is exerted

for advancing the cut parts of the tendon as far as the judgement of the operator may decide. The stitches are allowed to remain in 4 to 6 days, depending on the amount of reaction. The undivided part of the tendon serves a double purpose: 1. it prevents, to a great extent, the setting of the tendor too high or too low, and in that much avoids "twisting" the eye-ball on its antero-posterior axis: 2 should the knots slip or the threads cut their way out too soon, these undivided fibres prevent the tendon from going very far back behind the original point of attachment. This partial advancement reminds one of Stevens' partial tenotomies, the one being the reverse of the other.

DeWecker's *advancement*, the best of all operations of this class, has been discribed so that a fair contrast may be drawn between it and our own *shortening* operation.

Our operation for *shortening* a rectus muscle is simple, effective and free from the two prominent risks incurred in any of the *advancement* operations. In this, as in many other operations on the eye, cocaine anæsthesia can be relied on. The first step of our operation consists of a vertical conjunctival incision $\frac{1}{8}$ inch behind the insertion of the tendon and a little longer than the muscle is wide. From the lower extremity of this cut a horizontal conjunctival incision is made $\frac{1}{4}$ inch long, near to, and parallel with, the lower border of the muscle. The triangular flap of conjunctiva is now dissected up, and is held out of the way by an assistant. The second step of the operation consists in passing a strabismus hook beneath the tendon and in making a slight dissection of the connective tissue and capsule of Tenon at upper and lower border of muscle. Everything is now ready for the last operative procedure, the taking of the stitch for shortening the muscle. A thread is armed with two needles slightly curved. One needle is passed through the muscle from its outer surface and is brought out beneath the lower border of the muscle, the other is passed in same way but is brought out beneath the upper border of the muscle. The amount of tissue thus included in the loop need not be more than $\frac{1}{4}$ the width of the muscle; and the distance of this loop behind the insertion of the tendor must depend on the amount of shortening desired.

The muscle is held away from the globe by fixation forceps while the needles are being passed as above indicated. The operator now taking the hook into his own hand draws it slightly back and at the same time gently lifts the tendon from the globe. He now takes needle No. 1 and pierces the tendon from the ocular side, at its point of insertion and between the center and its lower border, bringing it out through the conjunctiva over the insertion, then removes the needle. In a similar way needle No. 2 is passed through the tendon between its center and upper border and is brought out through the conjunctiva over the insertion. This needle is then removed. The two ends of the one thread need not be more than $\frac{1}{8}$ inch apart as they emerge from the tendon. On tying the knot in the usual way, that part of the muscle at the loop is brought in contact with the tendon at its insertion and is there confined by completing the knot. The triangular flap of conjunctiva is now allowed to fall and cover in the exposed muscle, including its "tuck." The stitch is allowed to remain from 4 to 6 days, depending on the inflammatory action excited. The stitch will excite sufficient inflammation to bind the parts in their new relationship, and thus the shortening is made permanent. As in *advancements* so in the *shortening*, it is often necessary to do either a partial or a complete tenotomy of the opposing muscle.

A muscle thus shortened is not likely to "twist" the eyeball; if the twisting occur it would be but slight as compared with the result of an ordinary advancement. The stitch taken in the tendon will not cut its way out, as is so common when taken in the conjunctiva and sub-conjunctiva, therefore there will be no slipping back of the muscle from this cause. Should the knot untie the muscle cannot go further back than before, for no part of it has been cut loose from its original attachment.

The "knuckle of muscle" made by the operation undergoes absorption so that, in a few weeks, the parts become smooth at the site of the operation.

The operation described above we have done many times, with much satisfaction. Even if it had been devised by some one else, we think we would still prefer it over the very best advancement operations, and for the reasons given.

Department of Otology, Laryngology and Rhinology.

GEO. H. PRICE, M. D., EDITOR, 621½ Church Street,
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THE NEW YORK ACADEMY OF MEDICINE.

SECTION ON LARYNGOLOGY AND RHINOLOGY, STATED MEETING HELD ON WEDNESDAY EVENING, JAN. 25, 1893.

Dr. Robert C. Myles presented a number of curettes, with malleable handles, which he has found very serviceable in operations upon the necessary cavities. He also presented a syringe for puncturing the cheek and the Antrum of Highmore.

Dr. James E. Nichols presented a patient, a stone-mason by occupation, who five years ago was struck on the head by a falling body, producing a fracture on the frontal bone. For two years he suffered from severe pain in the right eye, with protrusion of the eye-ball and finally the eye became sclerosed. After a time a sinus appeared below the right eye. A probe introduced through this reveals a fracture extending through the orbital plate of the frontal bone, as far back as the opening of the sinus. The os planum of the ethmoid is separated entirely from its attachment, and there is a discrepancy of nearly half an inch in the line of the orbit. The sequestrum has not yet separated. Dr. Nichols said he shortly hopes to remove the dead bone by incision.

Dr. Nichols also presented a woman who had suffered from an abscess in the region of the eye, causing considerable exopthalmos. There was necrosis of the supra-orbital ridge and the orbital plate of the frontal bone, so that the frontal sinus was laid bare. With the electric motor he drilled a hole through the nasal cavity up through the frontal bone, entering into the

lower part of the sinus. This was kept open for two month by means of a tube, when the sinus was allowed to close.

Dr. D. Bryson Delevan presented a patient, a Russian, who three years ago was affected with scarcoma of the nasal cavity. He lived in St. Petersburgh at the time, and the growth was removed without the use of an anæsthetic. Afterwards under ether, an incision was made in the median line for the purpose of exploring the frontal sinus, but this plan was abandoned. The patient then went to Berlin, where Frænkel, by means of the galvano cautery, removed the sarcomatous growth from the nasal cavity. Dr. Delevan said he simply presented the case, which is one of recurrent sarcoma, to call attention to the fact that if the surgeon who performed the first operation had employed transillumination in studying the frontal sinuses, he would not have inflicted such a scar as this man carries. The nasal bones, once separated, never come together again. The man underwent a severe operation to no purpose, because so far as we are able to learn, there was no sarcomatous growth found in the frontal sinuses.

Dr. M. D. Lederman said he recently saw a patient whose nose was split in order to remove a nasal polypus. The scar in that ease was very evident.

Dr. A. Rupp presented a skull showing an anomalous condition of the accessory sinuses. On one side the frontal sinus was considerably deeper than on the other, and opened into the sphenoidal sinus.

Dr. Wendell C. Phillips said that by looking at the skull, he judged it to be a case of cystic degeneration communicating with the antrum.

DISEASES OF THE ACCESSORY SINUSES. TREATMENT AND INDICATIONS FOR OPERATIONS.

Dr. Robert C. Myles read a paper on this subject, and presented a number of patients and anatomical specimens, and read the history of several interesting cases to illustrate his remarks. He first gave a short description of the anatomical situation and relations of the maxillary, the frontal, the ethmoidal and the sphenoidal sinuses, and stated that up to

within a few years the diseases of these areas were seldom diagnosed until made manifest by the Versuvius-like demonstrations of their own. The frequency of cases in which these empyemic conditions are undiscovered would indicate carelessness or want of faith by most observers in the later diagnostic methods.

Although the physiology of these cells, Dr. Myles said, is not definitely settled, an analysis of their function points to the conclusion that they are intended to supply warm air and moisture for respiratory purposes. As to the cause of pyogenic conditions in these cavities, they can be conveniently separated into two classes, i. e. those of the antrum maxillaris and those of the ethmoid frontal and sphenoid sinuses. Excluding tumors, we can divide the cases of the antrum of Highmore, in a causal sense, into two divisions: First, those originating from the teeth in alveolar periostitis, periodontitis, attended by suppuration, caries, necrosis or other pathological changes at the root end. Second, those that find their origin in different congestive, inflammatory or proliferative conditions of the nasal and accessory sinus, mucous, submucous and periosteal tissues. The relative frequency of nasal and dental origin is a difficult question to decide, on account of the insidiousness of the early symptoms, the delay on the part of the patient in applying for relief and the physician in making the diagnosis. In regard to the cause of ethmoid, frontal and sphenoid cell disease, the majority were due to polypoid degeneration.

As to the diagnosis of this condition, pus or muco-pus discharging from either one or both nostrils, as anterior or post-nasal catarrh, and extending for any definite length of time, should always awaken our suspicions. Antrum disease, caused by the teeth, is generally unilateral, the discharge coming from one nostril and usually producing an unpleasant odor. The electric light, placed in the mouth, (the patient being in a dark room) will usually show the respective cheek beneath the eye to be dark and the opposite cheek, will present in splendid contrast, an irregular oblong illumination just below the lower lid. The electric light test is not infallible, but to one who uses it properly it is indispensable. For antrum use it is well to select a

three-candle power, about six volts and one and one-half amperes. In certain cases the electric light will demonstrate both antrums dark, and there will be no empyemic symptoms whatever. This condition is probably due to a peculiar thickening of the mucosa in that individual.

With regard to the treatment of diseases of the accessory sinuses, Dr. Myles said that the surgical rules for allowing the escape of purulent matter, curetting, removing dead bone, the application of caustic and antiseptic remedies to unhealthy and proliferative tissues should be undertaken here, as elsewhere, as early as possible after the detection of these cases. In many of them, however, there is so much surface area involved, and the patients are in such poor condition, that many months may be required for the numerous operations near the base of the brain. When the teeth are the cause of the antrum trouble, they should be removed and an opening drilled or trephined into the antrum. This opening into the cavity should be enlarged, until it is about 8 to 10 millimetres in diameter, and then, with the blunt and sharp curettes the antrum should be carefully explored and all granulation, polypoid and pyogenic tissues, as well as the softened or dead bone should be removed. The cavity is then packed with iodoform gauze, which in some cases requires changing every twenty-four hours; in others not so frequently. Solutions of boric and carbolic acids and peroxide of hydrogen seem to be the best for general daily irrigation. In order to destroy persistent granulating tissue, the speaker said that he has employed with varying success nitrate of silver, pyoktannin, alcohol, zinc, iodoform, etc. A remedy which in one case acts like magic in another case makes but little impression. In stubborn cases he has generally found extensive softening of the bone. In disease of the ethmoid and sphenoid cells a perforation should be made through their floors, first having removed the middle turbinated body. The small drill or trephine should be used, but in a very guarded manner. The frontal sinuses present more perplexing problems than any of the others. An external operation is usually refused by the patient. As it is necessary to have an opening from the nose up through the anterior ethmoidal cells, even in the event of the

external operation, Dr. Myles said that he generally clips, drills, trephines or curettes an opening along the infundibulm up into the frontal sinus, at once removing, if possible that part of the nasal process of the superior maxilla which forms the floor of the sinus, and the severe headaches usually subside.

Dr. Harris Allen, of Philadelphia, in opening the discussion, stated that his experience in this department of surgery was so different from that given by Dr. Myles that he hardly felt qualified to discuss the paper. With him, the diagnosis of these conditions is the chief point, as the patients almost invariably decline operation. He has seen a number of cases of empyema of the frontal and maxillary sinuses, and one of the sphenoidal sinus. Quite a number of these were of traumatic origin, due to the extraction of a tooth, and such patients often give a history of a rheumatic or other imperfect state of the general system, which is prone to give rise to inflammation elsewhere. Dr. Allen gave the history of a number of cases to illustrate this point. In one case of empyema of the maxillary sinus in a rheumatic subject the condition was relieved, only to be followed, two months afterwards by an empyema of the opposite sinus. Where such a diathesis exists, an inflammatory process may be lighted up by an apparently trivial cause.

In another group of cases, Dr. Allen said, the disease is the result of direct continuity of the inflammatory process. As regards the employment of the electric light in these conditions the speaker said that while he never makes a diagnosis without reaorting to this test, he does not consider its use indispensable. On account of the possible difference in the thickness of the bones of the two sides, the test is not always an infallible one. In a person with thick maxillary bones, you may be deceived by the transillumination. It should not, therefore, be regarded as the final test The pain over the fossa, and the fullness that is apt to exist he regards as important symptoms. Dr. Allen said he hoped that with our improved methods of local treatment in inflammation of the accessory sinuses we would have fewer excuses for operating. Pyoktanin he has found very useful in some of these cases. Under its influence the conditions uniformly improve. Respecting the means by which the maxillary

sinus should be opened, the extraction of a tooth, by itself, is valueless. Very often, when this is done, and an opening drilled through its socket up into the sinus, we may entirely fail in our object, and another operation must be performed, either going in through the nose or above the alveolar process. The best way of entering the sinus is to go in above the alveolar process, never through the tooth cavity, and the opening made should not be larger than is absolutely necessary. In some cases, in entering the sinus, where he found the bones, soft, he made a semilunar incision: there is a certain amount of adaptability or yielding to these bones, and the front of the maxilla can often be pushed upwards.

Dr. J. H. Bryan, of Washington, D. C. said that his experience with these inflammatory conditions had been somewhat different than that of both the previous speakers. He judged that most of Dr. Myle's cases were due to intra-nasal disease. His cases have chiefly originated from the teeth. He believed, with Dr. Allen, that many of these cases are due to the method of treating the teeth. A number of his cases were traced to the use of arsenious paste employed by dentists to kill the nerve of the tooth, the nerve not being thoroughly removed.

As regards symptoms, Dr. Bryan said he considers the light reflex as an interesting one, but he thought it was rarely witnessed. He has only observed it in two or three cases. Pain he has found to be almost invariably absent, excepting, perhaps over the canine fossa. The patient rarely complains of pain over the entire maxillary sinus. The odor from the discharge is perceptible to the patient; not so much to his friends This is an interesting point of differential diagnosis between this condition and atrophic rhinitis, where the odor is very perceptible to the patient's friends and not to himself. The discharge of pus through the nostrils is an interesting symptom, but it is common to suppurative inflammation of the maxillary, ethmoidal and frontal sinuses, so that it cannot be entirely relied upon. The electric light, Dr. Bryan said, he thought a very decided aid in the diagnosis of affections of the maxillary sinus. In many cases it has seemed deceptive because its use is not entirely understood. For instance, the rays of light, in passing

through the nasal cavity, are deflected by the turbinated body, and thus may give rise to a false impression. According to Davidson, the illumination of the eye is the only positive sign in an abscess of the maxillary cavity. The speaker said that in several cases of abscess of the antrum in which the discharge into the nasal cavity was absent or very slight,—the so-called latent abscesses—he was ventured to make the diagnosis simply by the odor.

In regard to the treatment of ethmoidal abscesses, Dr. Bryan said he does not feel inclined to act quite as heroically as some operators, who remove the middle turbinated body and then curette. He is of the opinion that many of these cases would get well without resorting to such extreme measures, and this opinion has been verified in a number of instances. In regard to the treatment of abscesses of the antrum, the best results he thought are obtained by entering through the alveolar process. If the tooth is present, of course that must be removed. For opening the sinus, the trephine gives us a better opening than the ordinary drill. He has done the intra-nasal operation several times, using for that purpose the instrument devised by Dr. J. Solis-Cohen. A number of cases of abscess of the antrum have been reported as cured by the use of injections of peroxide of Hydrogen through the natural opening in the middle meatus, but it is a very painful and tedious process and the hope of a cure is very slight. Dr. Bryan said he cannot recall a single case of polypoid degeneration of the antrum. As far as curetting the cavity is concerned, his patients have never allowed him to do it. He presented an instrument composed of a combined gouge and curette, to be employed in opening the ethmoidal cells. It has given great satisfaction in cases where there is much swelling of the anterior extremity of the middle turbinated body. He considers it superior to the drill or snare. The curette is small enough to enter the anterior ethmoidal cells and remove any carious bone. In suppuration of the antrum conditions may be present which we fail to recognize. There may be an extension of the polypoid degeneration, or cysts may form. For the purpose of thoroughly exploring the cavity, Dr. Bryan said, he has employed the endoscope devised by Dr. W. K. Otis.

The opening in the canine fossa or alveolar process can be enlarged, and the endoscopic tube passed in, and then, by means of the small mirror attached to the instrument the whole interior of the cavity is brought into view.

Although pain is an inconstant symptom, it is probably the best one we have in making a differential diagnosis between the diseases of the accessory cavities. Pus, as already stated, is a symptom common to inflammation of one of the three anterior cavities. The electric light (until Davidson called attention to the illumination of the eye) was objected to by some as unsatisfactory. In a case of inflammation of the sphenoidal sinus coming under his observation, the pain was in the middle of the head, not radiating to the various branches of the fifth nerve, but located principally at the base of the brain. With inflammation of the frontal sinus the pain is located at the supra-orbital ridge or over the nasal fossa, while with inflammation of the ethmoidal sinus the pain is located across the bridge of the nose and along the infra-orbital ridge. With chronic abscess of the maxillary sinus the pain is usually absent.

Dr. A. C. Getchell of Worcester, Mass., gave the history of an interesting case. The patient was a woman. The only point of interest in her family history was that her husband died of cancer. She had never suffered from nasal catarrh. She began to suffer from a pain in the right cheek, beneath the eye; this pain gradually became more severe and persistent. A dentist was consulted, but no relief obtained. A diagnosis of abscess of the antrum was made, and by means of a trocar a mass of broken down tissue was removed. This growth proved to be cancerous, and the patient died from a recurrence. During her illness a malignant growth also made its appearance in the left breast.

On account of the lateness of the hour, it was decided to postpone the further discussion of this subject until the next meeting of the Section.

WENDELL C. PHILLIPS, M.D., Secretary.

EAR-ACHE.

My friend Dr. Alex. Randall, of Philadelphia, is being quoted in some of our exchanges as follows:

"In conclusion, it may be repeated that ear-ache is most often due to acute tympanic inflammations arising from a naso-pharyngeal condition which demands treatment. Cleansing and detergent sprays and post-pharyngeal painting with astringents can control this and relieve any referred pain from this location. The hot syringing of the ear will give any needed cleansing, allay the local pain, and, by reducing the inflammatory congestion, help on the resolution. Protection, local and general, with medicinal treatment of general symptoms, will generally give such prompt and real relief that the host of other remedies may remain as an unemployed reserve. The physician summoned to to a case of ear-ache can generally leave his morphine and cocaine at home, if he will take his brow mirror, syringe, and an atomizer."

In the main I agree with the Doctor. I would, however, advise that the physician leave at home with his morphine and cocaine his *syringe* also, since we have at our easy command a remedy that is far more covenient and much more effective than a continuous stream of hot water however skillfully directed. This remedy is chloroform, f℥i to iss, in olive oil, q s., f℥i—The ear should first be cleansed by means of absorbent cotton on a tooth-pick or probe, in a most gentle manner, after which the ear should be filled with the solution, the patient lying for 10 minutes on the well side. This can be repeated as often as may be necessary. Usually it does not have to be repeated often. Its power to relieve pain, reduce inflammation and prevent suppuration is wonderful. For obvious reason the mixture should not be heated before being dropped into the ear.

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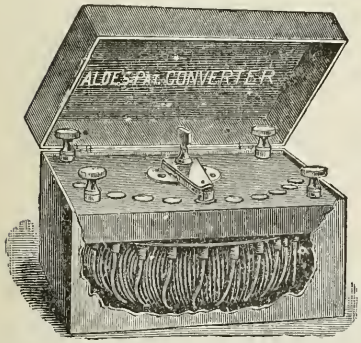

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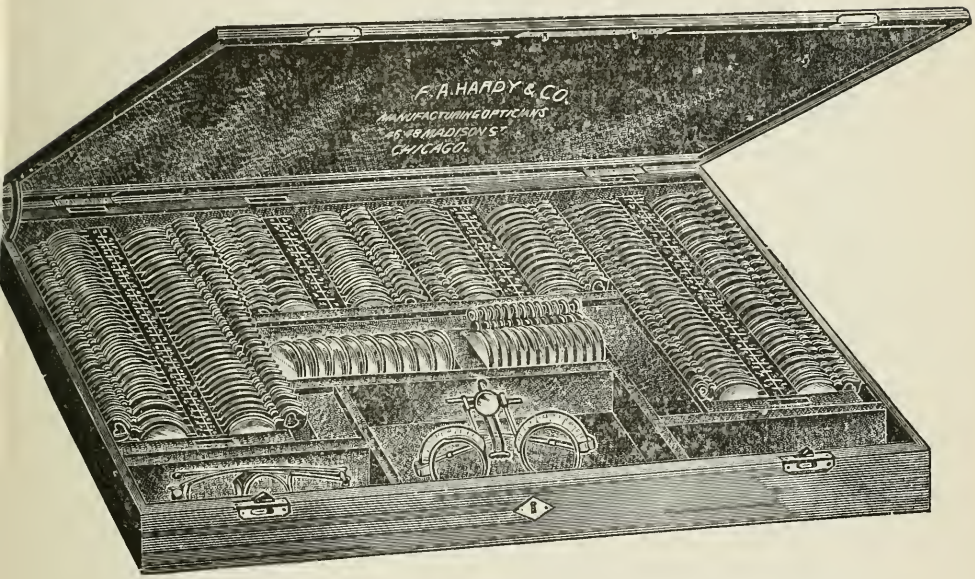

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